Remarks

It is indicated in the Office Action Summary dated August 16, 2006, that claims 1, 5 and 11 are allowed. Applicants assume that the Summary is not correct, and that claims 1, 5 and 11 were rejected.

Claims 1-19 are pending in this application. Claims 2-4, 6-10 and 12 are withdrawn. Claims 13-19 are new claims that are being added with this paper to complement claims 1, 5 and 11, which are the subject of the Examiner's Office Action of August 16, 2004.

Claim 1 has been amended by rewriting it. The rewriting is done to avoid numerous changes to claim 1 as originally filed.

Claim 5, which is dependent on claim 1, has been amended to avoid using the adjectives "coupled" and "lumped." This is done to make the claim more clear. Corresponding changes in wording are being made in the Specification at paragraph 25.

In the Office Action of August 16, 2006, the Examiner indicated that lines 4, 5 and 6 of claim 1 are unclear. Applicants now explain that the gearing that defines parallel torque flow paths from the engine and the motor to a torque output shaft is the gearing shown in Figure 1 at 12 and the countershaft gearing shown in Figure 1 at 30. The torque output of the gear unit, which is a planetary gear unit, is transferred from the planetary ring gear to countershaft gear element 16. The planetary gear unit 12 thus forms a torque flow path from the engine to gear element 16. Likewise, the motor 26 delivers motor torque through countershaft gearing 30. That motor torque is combined with the engine torque and delivered to the vehicle traction wheels. The torque output shaft is the shaft that connects the differential 40 with the countershaft gear element 38.

In answer to the Examiner's question on page 3 of the Office Action regarding the language used at claim 1, line 14, Applicants explain that the term "inertia" was intended

to be the same as "moment of inertia." Applicants have clarified this and rewritten claim 1 by using the term "moment of inertia" rather than "inertia."

In order to clarify the meaning of the expression "torque ratio from the motor to the vehicle traction wheels," Applicants now explain that the torque to which Applicants refer is the torque ratio of the gearing that connects the motor to the power output shaft. To avoid any confusion in rewritten claim 1, Applicants have indicated that the torque ratio of the gearing is calculated, rather than the torque ratio from the motor to the vehicle wheels. Likewise, the expression "torque ratio of the gearing between the generator and the motor" and the expression "torque ratio of the gearing between the engine and the motor" are used in rewritten claim 1.

Applicants have avoided the use of the term "couple moment of inertia" in order to avoid confusion, this term is replaced by the term "combined moment of inertia." Furthermore, the term "lumped motor and gearing inertia" and the term "lump generator inertia reflected at the motor" have been replaced by the term "combined moment of inertia" in rewritten claim 1. To provide consistency between the claims and the specification. The specification has been amended in paragraph 25.

In further response to the Examiner' questions, Applicants explain that the term "static gearing output torque" in claim 11 is the torque generated at the planetary gear unit that is modified by the countershaft gearing and reflected at the motor shaft.

It is believed that the rejection of claims 1, 5 and 11 as being unpatentable under 35 U.S.C. § 101 is avoided, especially as the claims now are written. The claims as presently presented are not merely recitations of abstract ideas, nor are they merely recitals of mathematical algorithms with no useful, concrete or tangible result. The claims as they presently are written recite actual structural detail that is used in executing algorithms that produce a tangible result. The fact that algorithms are used in executing the steps of the method defined by the claims does not justify a determination that the claims are unpatentable

under 35 U.S.C. § 101. The claims contain sufficient structure so that they define a patentable combination of elements that perform a particular function pursuant to instructions in software. Applicants' position in this respect is clearly consistent with recent decisions of the Court of Appeals for the Federal Circuit since at least 1994 (e.g., in *re: Alappat*, 33 F.3d 1526 (Fed. Cir. 1994). A process claim that includes an algorithm to produce a useful, concrete and tangible result clearly is within a class of patentable subject matter and does not preempt other uses of the claimed mathematical principle (*AT&T Corp. v. Excel Comm., Inc.*, 172 F.3d 1352 (Fed. Cir. 1999).

In the present instance the tangible result that is achieved by the present method is the control of torque at the wheels of a vehicle of a hybrid powertrain so that for any given torque command, the torque at the wheels will be within a precalculated threshold, which prevents uncontrolled torque distribution to the traction wheels under varying operating conditions. This feature may be of importance in a vehicle powertrain that uses a so-called drive-by-wire engine throttle control.

Claims 1, 5 and 11 were rejected in the Office Action as being unpatentable over 35 U.S.C. § 103 over Kowatari, et al. in view of Fujikawa. Applicant does not agree that this rejection under 35 U.S.C. § 103 is proper; but it any case, these references are not applicable to Applicants' claims as amended, nor to the claims that have been added. The Kowatari et al. reference describes a powertrain configuration that is entirely distinct from Applicants' hybrid powertrain configuration. In the Kowatari et al. reference device, the front vehicle wheels are driven by the engine and the rear wheels are driven by the motor. The controller controls the function of the motor in such as way that stability and traction for the vehicle may be improved. This is done by ensuring that the electric motor torque delivered to the vehicle rear wheels will not exceed engine torque delivered to the vehicle front wheels. The controller does not function in a manner similar to the function of Applicants' control system as defined by Applicants' claims, especially as they now are presented.

The various calculations enumerated by the Examiner on page 4 of the Office Action are part of an unrelated control method. The objective of the control method of the reference is not related to Applicants' control method where engine torque and motor torque are combined and where the controller effectively controls torque distribution from both the engine and the motor in such a way that a command by the controller for traction torque and the actual traction are within a pre-calibrated threshold of torque values.

The Examiner recognizes on page 5 of the Office Action that the Kowatari et al. reference does not disclose steps for calculating moments of inertia of both the motor and the generator, but he indicates that this step can be supplied by the teachings of Fujikawa. Applicant disagrees with this line of reasoning for two reasons. In the first place, it appears to applicant that the Examiner's line of reasoning in this respect uses hindsight knowledge. There is no suggestion in the basic reference for applying a step of calculating moments of inertia of a motor and a generator. Secondly, the Fujikawa reference shows a parallel hybrid vehicle powertrain that has only a single electric machine that functions either as a motor or a generator. This is in clear contrast to Applicants' powertrain, which uses a first electric machine, referred to as a generator, and a second electric machine that is referred to as a motor. Clearly a person having a teaching of the Kowatari et al. reference available would not be inclined to refer to a reference such as the Fujikawa reference, which discloses a powertrain of a powertrain class that is entirely different from both the powertrain of the Kowatari et al. reference and Applicants' powertrain.

Applicants' rewritten claim 1 includes method steps that refer to a parallel operating mode as well as a non-parallel operating mode. Original claim 1 referred only to a non-parallel operating mode, and original claim 2 referred only to a parallel operating mode.

Claim 5 recites an algorithm that is used in the estimation of total wheel torque. Inclusion of the algorithm, as explained in the preceding discussion, does not render the claim unpatentable and does not remove the claimed subject matter from a class of patentable subject matter. Claim 5, since it includes the features of parent claim 1, is not a mere recitation of an

abstract idea. Applicants do not agree with the Examiner's conclusionary statement on paragraph 4 of page 5 of the Office Action where it is indicated that it would be obvious to a person skilled in the art at the time the invention was made to incorporate the equation indicated in claim 5. This statement is not supported by the references, and it appears to Applicants to involve mere hindsight. Applicants' invention, in contrast to the teachings of the references, is a method for estimating wheel torque so that the commanded wheel torque in a powertrain for a hybrid vehicle will correspond to the actual traction wheel torque so that wheel torque thresholds for given torque commands are not exceeded.

New claim 13 is a further definition of the static gearing output torque determination when the powertrain is operated in a parallel operating mode. Claim 14 is similar to claim 13, but it is directed to a non-parallel operating mode.

Claim 15 is a recital of the steps in a subroutine of the method set forth in Applicants' Figure 3. As indicated in Figure 3, the subroutine indicated at 76 determines whether the powertrain is operating in a parallel operating mode or a non-parallel operating mode. This determination is made so that the subroutine shown at 94 in Figure 2, or the subroutine at 96 shown at Figure 2, can be carried out before the actual calculation of an estimate of total wheel torque is made as indicated at step 98 in Figure 2.

New claim 16 is similar to claim 1, but a specific recitation is not included in new claim 16 dealing with the calculation of static gearing output torque in a parallel operating mode. New claim 17 is similar to claim 16, but it recites the step of calculating static gearing output torque when the powertrain is operating in the parallel operating mode rather than the non-parallel operating mode.

Claims 18 and 19 are claims that are dependent on claims 16 and 17 respectively. They recite an algorithm for determining static gearing output torque for the non-parallel operating mode and the parallel operating mode respectively. As previously indicated,

the presence of this algorithm in the claim does not render the claim unpatentable under 35 U.S.C. § 101.

A favorable consideration of claims 1, 5, 11, 14, 15, 16, 17, 18 and 19 is solicited respectfully.

Respectfully submitted,

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